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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/586,624	06/02/2000	Naoya Hasegawa	9281/3660	6578

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EXAMINER
BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
1773	

DATE MAILED: 09/02/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

AS-16

Office Action Summary	Application No.	Applicant(s)	
	09/586,624	HASEGAWA, NAOYA	
	Examiner	Art Unit	
	Kevin M Bernatz	1773	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-14 is/are pending in the application.

4a) Of the above claim(s) 10-14 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-9 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. Amendments to claim 1, filed on July 3, 2003, have been entered in the above-identified application.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Request for Continued Examination

3. The Request for Continued Examination (RCE) under 37 CFR 1.53 (d) filed on July 3, 2003 is acceptable and a RCE has been established. An action on the RCE follows.

Claim Rejections - 35 USC § 103

4. Claims 1, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin ('767) in view of Gill et al. ('866).

Regarding claim 1, Lin discloses a spin-valve magnetoresistive (MR) sensor comprising, on a substrate (*Figure 3, element 17*), an antiferromagnetic layer (*element* AFM_1), a pinned magnetic layer formed in contact with said antiferromagnetic layer (*element 32*) and having a magnetization direction made stationary under an exchange anisotropic magnetic field generated by interaction with said antiferromagnetic layer (*col. 5, lines 54 – 58*), a non-magnetic electrically conductive layer (*element 35*) formed

between a free magnetic layer (*element 36*) and said pinned magnetic layer, soft magnetic layers (*elements 41*) arranged on said free magnetic layer, bias layers (*elements AFM_2*) formed on said soft magnetic layers to uniformly arrange a magnetization direction of said free magnetic layer in a direction crossing the magnetization direction of said pinned magnetic layer (*col. 5, lines 63 – 66; col. 6, lines 50 – 54; col. 6, line 65 bridging col. 7, line 2*), and electrically conductive layers (*element 43*) formed on the bias layers to apply a detection electric current to said free magnetic layer (*intended use limitation, but see col. 7, lines 3 – 5*), wherein said antiferromagnetic layer (AFM_1) and bias layers (AFM_2) each comprising an alloy containing Mn and at least one element selected from the group consisting of Pt, Pd, Rh, Ru, Ir, Os, Au, Ag, Cr, Ni, Ne, Ar, Xe, and Kr (*col. 5, lines 59 – 62 and col. 6, lines 45 – 50*). See also Lin, col. 5, line 26 bridging col. 7, line 38 for the entire description of Figure 3.

The limitation "having a spacing between said soft magnetic layers corresponding to a track width defined at a level at which said soft magnetic layers fill recesses in the free magnetic layer" is a functional limitation(s). As defined in the MPEP, "[a] functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971)" – MPEP § 2173.05(g). However, the examiner notes that "where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the

claimed subject matter may, in fact, be an ***inherent charact ristic of the prior art***, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on" (emphasis added) - MPEP § 2183.

In the instant case, the above claimed limitation(s) is a functional limitation(s) and is deemed to be necessarily met by the prior art since the prior art is substantially identical in composition and/or structure. The examiner's sound basis for this assertion is that Gill et al. explicitly teach that the track width is known to be defined by the distance between the two spaced-apart end regions in a MR sensor (*Gill et al., Figure 7, elements 76; and col. 8, lines 4 – 8*).

Lin fails to disclose the limitation "wherein a thickness of said soft magnetic layers exceeds a depth of the recesses".

However, the Examiner deems that the thickness of the soft magnetic "seed layers" can be varied to effect the exchange coupling interaction between the AFM bias layers (*Lin, "AFM_2" layers*) and the free layer (*Lin, layer 36*) in a magnetic sensor, since the coupling force depends on the relative "closeness" of the two layers. Furthermore, Gill et al. provides evidence that the thickness of the soft magnetic "seed layers" can exceed the depth of the recess, including a thickness up to the height of the non-magnetic cap layer (*Figure 7, layers 74 and col. 7, line 37 bridging col. 8, line 14*). Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an optimal relative thickness of the soft magnetic "seed layers" by optimizing the results effective variable through routine experimentation. *In*

re Boesch, 205 USPQ 215 (CCPA 1980); *In re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Aller*, 220 F.2d, 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Regarding claim 7, Lin discloses the soft magnetic layers as being preferably NiFe (*col. 6, lines 34 - 35*).

Regarding claim 8, Lin discloses a free magnetic layer meeting applicant's claimed limitations (*Figure 3, recesses are the regions where element 41 is deposited*).

5. Claims 2 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin in view of Gill et al. as applied above, and further in view of Rottmayer et al. ('673) and applicant's admissions.

Regarding claims 2 and 9, Lin in view of Gill et al. disclose the claimed invention as described above.

Neither Lin nor Gill et al. disclose a free magnetic layer comprising a first free magnetic layer, a second free magnetic layer and a non-magnetic layer interposed between them, nor the magnetization directions and thickness values of the two free magnetic layers.

However, Rottmayer et al. teach that it is old in the art to use a "synthetic free magnetic layer" comprising a free magnetic layer meeting applicant's claimed limitations inorder to maintain a high magnetoresistance and allow for higher reading densities (*col. 1, lines 54 – 67*). Rottmayer et al. further disclose that the magnetization directions are in directions 180° different from each other (*col. 4, lines 5 – 8 and Figure 1B*) and

that the thickness of each layer can be optimized to control the relative magnetic moments and the mean free path of the electrons (*col. 1, line 62 bridging col. 2, line 9; col. 4, lines 15 – 23*).

Rottmayer et al. fail to disclose whether the first or second free magnetic layer should be the thicker layer.

However, applicant admits that it is old in the art to form a synthetic free magnetic layer where the relative magnetic moments can be optimized by controlling the thickness of the layers to meet applicant's claimed relative thickness limitations (*specification, page 9, line 6 bridging page 11, line 5*).

It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Lin in view of Gill et al. to use a synthetic free magnetic layer meeting applicant's claimed structural and thickness limitations as taught by Rottmayer et al. and as admitted by applicant inorder to maintain a high magnetoresistance and allow for higher reading densities.

6. Claims 3 - 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin in view of Gill et al. as applied above, and further in view of Kishi et al. ('643).

Lin discloses the claimed invention as described above.

Regarding claims 3 and 4, Lin fails to explicitly disclose a Mn-X alloy meeting applicant's claimed limitations.

However, Lin teaches Mn alloys as suitable alloys for the various anti-ferromagnetic layers (*col. 5, lines 59 – 62 and col. 6, lines 45 – 50*) though Lin fails to explicitly teach that these are equimolar compositions.

However, Kishi et al. teach that the amount of Mn and non-Mn elements and can be varied to effect the magnetic properties of the antiferromagnetic films in a magnetic sensor (*Figures 8 and 9*). Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an amount of Mn in the Mn alloy meeting applicant's claimed composition limitation by optimizing the results effective variable through routine experimentation.

Regarding claims 5 and 6, Kishi et al. teach PtMn-X alloys meeting applicant's claimed composition limitations as good antiferromagnetic layers in MR sensors since they possess superior corrosion resistance (*col. 2, lines 48 – 62; col. 3, line 56 bridging col. 4, line 20; claim 1; and Figures 8 and 9*). It would therefore have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Lin in view of Gill et al. to use a PtMn-X antiferromagnetic composition as taught by Kishi et al. inorder to form antiferromagnetic layers possessing superior corrosion resistance.

Response to Arguments

7. The rejection of claims 1 - 9 under 35 U.S.C § 103(a) – Rottmayer et al. in view of various references

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

The above noted rejection has been withdrawn in view of applicant(s) arguments, which have been found persuasive. Specifically, applicant(s) argue that Rottmayer et al. fail to explicitly describe a recess being formed in the free magnetic layer beyond what one of ordinary skill in the art would readily accept as "machine tolerance" when performing the known technique of etching/ion lithography. The Examiner deems that one of ordinary skill in the art would clearly recognize that the scope of applicant's invention is directed to a case where the "recess" formed is beyond any minor etching of the free magnetic layer that would form during standard etching/ion lithographic removal of the protecting layer(s).

8. The rejection of claims 1 - 9 under 35 U.S.C § 102(e) or 103(a) – Lin, either alone or in view of various references

Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (703) 308-1737. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Thibodeau can be reached on (703) 308-2367. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0651.

Kevin M. Bernatz
Patent Examiner

August 28, 2003